

CLAIM AMENDMENTS

1-98. (Cancelled)

99. (Currently Amended) An automatic focusing method for an optical system, comprising the steps:

(a) performing an initial coarse focus ~~at a first position substantially action along a focal axis at a scan position~~ corresponding to a ~~first~~ point on a surface ~~substantially corresponding to the surface~~ of a slide; and

(b) subsequently ~~respectively~~ performing a plurality of subsequent fine focuses ~~at different positions actions along a plurality of focal axes at a plurality of scan positions corresponding to different points on the slide surface~~, wherein each of the fine focuses ~~are actions~~ is performed more quickly than the initial coarse focus action.

100-101. (Cancelled)

102. (New) The method of claim 99, wherein the performance of the course focus action comprises determining an in-focus coordinate along the focal axis.

103. (New) The method of claim 102, wherein the performance of each of the fine focus actions is based on the in-focus coordinate determined in the course focus action.

104. (New) The method of claim 103, wherein the performance of each of the fine focus actions comprises estimating an in-focus coordinate along the respective focal axis as a function of the in-focus coordinate determined in the course focus action.

105. (New) The method of claim 103, wherein the performance of each of the fine focus actions comprises estimating an in-focus coordinate along the respective focal axis based on a function of the in-focus coordinate determined in the course focus action and a global focal plane.

106. (New) The method of claim 99, wherein the performance of the course focus action comprises repeatedly obtaining an image of the slide at different coordinates along the focal axis until an in-focus coordinate is determined.

107. (New) The method of claim 99, wherein the performance of each of the fine focus actions comprises estimating an in-focus coordinate along the respective focal axis and obtaining images of the slide at predetermined coordinates relative to the estimated in-focus coordinate along the respective focal axis.

108. (New) The method of claim 99, wherein the performance of at least one of the course focus action and each fine focus action comprises:

obtaining images of the slide at a plurality of coordinates along the focal axis;  
determining a plurality of focus scores for the respective coordinates; and  
selecting one of the coordinates as an in-focus coordinate based on the focus scores.

109. (New) The method of claim 108, wherein the coordinate having a maximum focus score is the coordinate selected as the in-focus coordinate.

110. (New) The method of claim 99, wherein the slide carries a biological specimen.

111. (New) The method of claim 99, wherein the course focus action and fine focus actions are performing during a single image scan.

112. (New) The method of claim 99, wherein the performance of one or both of the course focus action and fine focus actions comprises moving an element of the optical system relative to the slide surface to coordinates along the respective focal axes.

113. (New) The method of claim 99, wherein the performance of the fine focus actions comprises moving an element of the optical system relative to the slide along a scan axis to the respective scan positions.

114. (New) An automatic focusing method for an optical system, comprising:  
performing an initial course focus action along a focal axis at a scan position corresponding to a point on a surface of a slide; and  
respectively performing a plurality of subsequent fine focus actions along a plurality of focal axes at a plurality of scan positions corresponding to different points on the slide surface, wherein the performance of at least one of the fine focus actions comprises defining an initial coordinate along the respective focal axis based on a global focal plane, and obtaining images of the slide at a plurality of coordinates relative to the initial coordinate along the respective focal axis.

115. (New) The method of claim 114, wherein the initial coordinate corresponds to a point on the global focal plane.

116. (New) The method of claim 114, wherein the initial coordinate is an estimated in-focus coordinate along the respective focal axis.

117. (New) The method of claim 114, wherein each of the coordinates is a predetermined distance from the initial coordinate.

118. (New) The method of claim 114, wherein the performance of the course focus action comprises determining an in-focus coordinate along the focal axis.

119. (New) The method of claim 118, wherein the performance of each of the fine focus actions is based on the in-focus coordinate determined in the course focus action.

120. (New) The method of claim 119, wherein the performance of each of the fine focus actions comprises estimating an in-focus coordinate along the respective focal axis as a function of the in-focus coordinate determined in the course focus action and the global focal plane, wherein the initial coordinate is an estimated in-focus coordinate along the respective focal axis.

121. (New) The method of claim 114, wherein the performance of the course focus action comprises repeatedly obtaining images of the slide at different coordinates along the focal axis until an in-focus coordinate is determined.

122. (New) The method of claim 116, wherein the performance of each of the fine focus actions comprises obtaining images of the slide at predetermined coordinates relative to the estimated in-focus coordinate along the respective focal axis.

123. (New) The method of claim 114, wherein the performance of each fine focus action comprises selecting one of the plurality of coordinates as an in-focus coordinate based on an analysis of the obtained images.

124. (New) The method of claim 114, wherein the performance of at least one of the course focus action and each fine focus action comprises:

obtaining images of the slide at a plurality of coordinates along the focal axis;  
determining a plurality of focus scores for the respective coordinates; and  
selecting one of the coordinates as an in-focus coordinate based on the focus scores.

125. (New) The method of claim 124, wherein the coordinate having a maximum focus score is the coordinate selected as the in-focus coordinate.

126. (New) The method of claim 114, wherein the slide carries a biological specimen.

127. (New) The method of claim 114, wherein the course focus action and fine focus actions are performing during a single image scan.

128. (New) The method of claim 114, wherein the performance of one or both of the course focus action and fine focus actions comprises moving an element of the optical system relative to the slide surface to coordinates along the respective focal axes.

129. (New) The method of claim 114, wherein the performance of the fine focus actions comprises moving an element of the optical system relative to the slide along a scan axis to the respective scan positions.

130. (New) An automatic focusing method for an optical system, comprising:  
performing an initial course focus action along a focal axis at a scan position corresponding to a point on a surface of a slide; and  
respectively performing a plurality of subsequent fine focus actions along a plurality of focal axes at a plurality of scan positions corresponding to different points on the slide surface, wherein the performance of at least one of the fine focus actions comprises obtaining images of the slide at a plurality of coordinates within a predetermined range along the respective focal axis.

131. (New) The method of claim 130, wherein the coordinates are evenly distributed within the predetermined range.

132. (New) The method of claim 130, wherein the performance of each fine focus action comprises determining an in-focus coordinate along the focal axis.

133. (New) The method of claim 130, wherein the performance of the course focus action comprises determining an in-focus coordinate along the focal axis.

134. (New) The method of claim 133, wherein the performance of each of the fine focus actions is based on the in-focus coordinate determined in the course focus action.

135. (New) The method of claim 134, wherein the performance of each of the fine focus actions comprises estimating an in-focus coordinate along the respective focal axis as a function of the in-focus coordinate determined in the course focus action and a global focal plane.

136. (New) The method of claim 130, wherein the performance of the course focus action comprises repeatedly obtaining an image of the slide at different coordinates along the focal axis until an in-focus coordinate is determined.

137. (New) The method of claim 132, wherein the performance of each of the fine focus actions comprises obtaining images of the slide at predetermined coordinates relative to the estimated in-focus coordinate along the respective focal axis.

138. (New) The method of claim 130, wherein the performance of each fine focus action comprises selecting one of the plurality of coordinates as an in-focus coordinate based on an examination of the images.

139. (New) The method of claim 130, wherein the performance of at least one of the course focus action and each fine focus action comprises:

obtaining images of the slide at a plurality of coordinates along the focal axis;  
determining a plurality of focus scores for the respective coordinates; and  
selecting one of the coordinates as an in-focus coordinate based on the focus scores.

140. (New) The method of claim 139, wherein the coordinate having a maximum focus score is the coordinate selected as the in-focus coordinate.

141. (New) The method of claim 130, wherein the slide carries a biological specimen.

142. (New) The method of claim 130, wherein the course focus action and fine focus actions are performing during a single image scan.

143. (New) The method of claim 130, wherein the performance of one or both of the course focus action and fine focus actions comprises moving an element of the optical system relative to the slide surface to coordinates along the respective focal axes.

144. (New) The method of claim 130, wherein the performance of the fine focus actions comprises moving an element of the optical system relative to the slide along a scan axis to the respective scan positions.

145. (New) An automatic focusing method for an optical system, comprising:  
performing an initial course focus action along a focal axis at a scan position corresponding to a point on a surface of a slide; and  
respectively performing a plurality of subsequent fine focus actions along a plurality of focal axes at a plurality of scan positions corresponding to different points on the slide surface, wherein the performance of each of the fine focus actions comprises determining an in-focus coordinate along the respective focal axis, determining an area of fine focus jurisdiction surrounding the respective point, and correlating the in-focus coordinate to the respective fine focus jurisdiction.

146. (New) The method of claim 145, wherein each of the fine focus jurisdiction areas is generally elliptical in shape.

147. (New) The method of claim 146, wherein each of the fine focus jurisdiction areas has a major axis substantially parallel to a scan axis of the optical system and has a minor axis substantially parallel to an index axis of the optical system.

148. (New) The method of claim 145, further comprising determining if another scan position corresponds to a point within at least one previously determined fine focus jurisdiction.

149. (New) The method of claim 148, further comprising performing a fine focus action along a focal axis at the other scan position if the other scan position does not correspond to a point within at least one previously determined fine focus jurisdiction.

150. (New) The method of claim 149, further comprising determining an area of fine focus jurisdiction surrounding the other point.

151. (New) The method of claim 148, further comprising determining if the other scan position corresponds to a point within exactly one previously determined fine focus jurisdiction.

152. (New) The method of claim 151, further comprising using the in-focus coordinate correlated to the exactly one previously determined fine focus jurisdiction to define an in-focus coordinate along a focal axis at the other scan position if the other scan position is determined to correspond to a point within exactly one previously determined fine focus jurisdiction.

153. (New) The method of claim 152, further comprising correcting the in-focus coordinate correlated to the exactly one previously determined fine focus jurisdiction for tilt based on a global focal plane, wherein the corrected in-focus coordinate is used as the in-focus coordinate at the other scan position.

154. (New) The method of claim 148, further comprising determining if the other scan position corresponds to a point within more than one previously determined fine focus jurisdiction.

155. (New) The method of claim 154, further comprising using a weighted average of the in-focus coordinates of the more than one previously determined fine focus jurisdiction to define an in-

focus coordinate along a focal axis at the other scan position if the other scan position is determined to correspond to a point within more than one previously determined fine focus jurisdiction.

156. (New) The method of claim 155, further comprising correcting the weighted average of in-focus coordinates for tilt based on a global focal plane, wherein the corrected weighted average of in-focus coordinates is used as the in-focus coordinate at the other scan position.

157. (New) The method of claim 145, wherein the performance of the course focus action comprises determining an in-focus coordinate along the focal axis.

158. (New) The method of claim 157, wherein the performance of each of the fine focus actions is based on the in-focus coordinate determined in the course focus action.

159. (New) The method of claim 158, wherein the performance of each of the fine focus actions comprises estimating an in-focus coordinate along the respective focal axis as a function of the in-focus coordinate determined in the course focus action.

160. (New) The method of claim 158, wherein the performance of each of the fine focus actions comprises estimating an in-focus coordinate along the respective focal axis based on a function of the in-focus coordinate determined in the course focus action and a global focal plane.

161. (New) The method of claim 145, wherein the performance of the course focus action comprises repeatedly obtaining an image of the slide at different coordinates along the focal axis until an in-focus coordinate is determined.

162. (New) The method of claim 145, wherein the performance of each of the fine focus actions comprises estimating an in-focus coordinate along the respective focal axis and obtaining images of the slide at predetermined coordinates relative to the estimated in-focus coordinate along the respective focal axis.

163. (New) The method of claim 145, wherein the performance of at least one of the course focus action and each fine focus action comprises:

obtaining images of the slide at a plurality of coordinates along the focal axis;  
determining a plurality of focus scores for the respective coordinates; and  
selecting one of the coordinates as an in-focus coordinate based on the focus scores.

164. (New) The method of claim 163, wherein the coordinate having a maximum focus score is the coordinate selected as the in-focus coordinate.

165. (New) The method of claim 145, wherein the slide carries a biological specimen.

166. (New) The method of claim 145, wherein the course focus action and fine focus actions are performing during a single image scan.

167. (New) The method of claim 145, wherein the performance of one or both of the course focus action and fine focus actions comprises moving an element of the optical system relative to the slide surface to coordinates along the respective focal axes.

168. (New) The method of claim 145, wherein the performance of the fine focus actions comprises moving an element of the optical system relative to the slide along a scan axis to the respective scan positions.